Journal of Surgical Oncology 63:52–56 (1996)

Intrathoracic Anastomosis After Oesophageal Resection for Cancer

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Cervical anastomosis has been advocated to avoid the pulmonary complications and life-threatening anastomotic disruptions following intrathoracic oesophagogastric anastomosis. This is a retrospective review of 111 oesophageal resections followed by an intrathoracic anastomosis. These resections were performed between September 1993 and August 1994 within a residency training program. The left thoracoabdominal approach was used for distal tumours and the Ivor Lewis technique for more proximal tumours. Squamous cell carcinoma accounted for 72% patients (n = 80), adenocarcinoma for 25% (n = 28), and others for 2.7% patients (n = 3). Of the patients, 69% had pathologic Stage III tumours. Operative mortality rate was 1.8% (two patients). Perioperative complications occurred in 39 patients, including anastomotic leak in 10 patients and myocardial infarction in 2 patients. In the absence of a leak, there were no major pulmonary complications requiring intensive care or ventilatory support. Of those patients with anastomotic disruption, 80% were salvaged by early clinical diagnosis and appropriate treatment. We conclude that transthoracic oesophagectomy with an intrathoracic anastomosis is a safe procedure that can be performed with low mortality and acceptable morbidity.

KEY WORDS: **oesophagogastric anastomosis, anastomotic leak, left thoraco-abdominal approach, Ivor Lewis technique**

INTRODUCTION

Oesophageal surgery for cancer remains a challenge due to the technical difficulties of resection and reconstruction, age and poor nutritional state of the patient, associated cardiorespiratory disease, and difficulties of treating mediastinal and pleural sepsis. The two chief criticisms against transthoracic oesophagectomy followed by an intrathoracic anastomosis are serious postoperative pulmonary complications and mediastinitis following an anastomotic disruption, which may prove fatal in 50% of the patients [1–5]. The current operative mortality for transthoracic oesophagectomy with an intrathoracic anastomosis ranges from 2–14% [6–13]. Many authors therefore, recommend total oesophagectomy with cervical anastomosis in order to minimise the risk of major pulmonary complications and life-threatening anastomotic failures [13–18].

This study evaluates 111 consecutive oesophagogastrectomies with an intrathoracic anastomosis, focusing on perioperative morbidity and mortality.

MATERIALS AND METHODS

A study was made of the records of 111 consecutive patients who underwent an elective oesophageal resection followed by an intrathoracic anastomosis between September 1, 1993 and August 31, 1994. There were 70 men and 41 women in a ratio of 1.7:1. The median age was 53.5 years for men and 52.5 years for women (range 33–78 years). Sixty-four patients had tumours in the mid-

Accepted for publication April 26, 1996.
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dle oesophagus, and 47 tumours were in the distal oesophagus. Eighty patients (72.1%) had squamous cell carcinoma, 28 (25.2%) had adenocarcinoma, and the remaining 3 patients had leiomyosarcoma, leiomyoma, and recurrent achalasia cardia, respectively. Pathologic Stage III tumours (T3N1M0, T4N1M0) accounted for 68.8% of squamous carcinoma patients and 78.6% of the patients with adenocarcinoma. The remaining 31.2% patients with squamous carcinoma and 21.4% patients with adenocarcinoma were of stage II (T2N0M0, T3N0M0, T1N1M0, T2N1M0) according to the TNM staging system [19]. The median hospital stay was 13 days.

Preoperative Evaluation

All patients had a barium swallow with stomach assessment for a gastric conduit, oesophagoscopy with biopsy, chest roentgenogram, pulmonary function test, ultrasound of abdomen, and bronchoscopy for tracheal involvement in middle third tumours. Computed tomographic scans of the chest and abdomen were obtained only in cases of doubtful resectability. Patients with metastatic disease, including cervical node metastasis or fixed vocal cord, were considered unsuitable for oesophagectomy.

Preoperative Preparation

The preoperative preparation included correction of anaemia, fluid, and electrolyte imbalances. All patients received formal instruction in chest physiotherapy such as use of the football bladder and incentive spirometry. None of the patients received preoperative enteral or parenteral nutritional support.

Surgical Technique

Transthoracic oesophagectomy or the Ivor Lewis procedure [20] for middle third tumours consisted of laparotomy for preparation of the substitution organ, which was the stomach in this series, followed by a right posterolateral thoracotomy for oesophagectomy, adequate regional lymphadenectomy [21], and an intrathoracic oesophagogastrostomy well above the arch of the vena azygos (64 patients). For growths localised to the lower third of the oesophagus and cardio-oesophageal junction (47 patients), a left thoracolaparotomy through the seventh intercostal space was employed with an intrathoracic anastomosis at the level of the left inferior pulmonary vein. The diaphragmatic incision was radial in 27 patients and circumferential (nerve sparing) in 20 patients [22]. The oesophagogastric anastomosis was hand-sewn, interrupted, using full thickness sutures through stomach and oesophagus, with 3 (0) dexon, vicryl, or black silk and supported by a second layer of the oesophageal muscle and gastric serosa. A pyloromyotomy was performed in all cases, a temporary feeding jejunostomy in 63 patients and splenectomy in 2 patients. All procedures were performed by the faculty, resident surgeons, or fellows within a residency training program.

Postoperative Care

All patients received perioperative antibiotics, and most patients were extubated on the day of operation [23]. Jejunostomy feeds were started on the third day. Oral liquids were commenced on the fourth postoperative day. The nasogastric tube was removed a few days later once liquids were well tolerated. Contrast radiographic studies using thin barium were obtained only if there was clinical evidence to suspect an anastomotic leak or if there was difficulty in performing the anastomosis at the time of operation [8]. Adequate pain relief was achieved by administration of morphine through the thoracic epidural catheter twice a day. Physiotherapy was commenced on the day following operation.

Anastomotic disruption was categorized into three degrees based on clinical and radiological findings [5,24], as follows: (1) major—early evidence of leak (third to fifth postoperative day) with septicaemia, haemodynamic instability, and major disruption on contrast study, (2) moderate—manifests on fifth to eighth postoperative day with pulmonary or cardiac disturbances in a relatively stable patient, and (3) minor—Asymptomatic patient with leak diagnosed only on radiological examination (radiological leak).

RESULTS

Mortality

Operative mortality was defined as any death within 30 days of operation or during hospitalization. The operative or hospital mortality rate in this series was 1.8% (2/111). The cause of death in both cases was sepsis secondary to anastomotic leak.

Morbidity

Early complications occurred in 35% patients (39/111) as shown in Table I. These included anastomotic disruption in 10 patients and myocardial infarction in 2 patients. Excluding patients with an anastomotic leak, there were no major respiratory complications requiring intensive care or ventilatory support. A left subphrenic collection occurred secondary to splenectomy and required surgical drainage.

Of the 10 (9%) anastomotic failures, 2 were major, 6 moderate, and 2 minor or radiological leaks. Five leaks occurred in patients who had undergone an Ivor Lewis procedure (right chest anastomosis), and five in patients who had resection and anastomosis of the oesophagus (left chest anastomosis). Of the two leak-related deaths, one patient had undergone an Ivor Lewis procedure and the other a left chest anastomosis following an oesophagogastrectomy, giving a salvage rate of 80%. Six patients were salvaged by conservative treatment consisting of nil

TABLE I. Early Complications in 111 Patients After Oesophagectomy

Complication	No. patients (N = 39)
Anastomotic leak	10
Pulmonary (excluding leaks)	
Atelectasis	6
Pneumonia	0
Pneumothorax	6
Cardiac	
Arrhythmia	2
Myocardial Infarction	2
Others	
Recurrent laryngeal nerve injury	2
Chylous leak	1
Subphrenic collection	1
Gastric outlet obstruction	1
Jejunostomy-related	4
Burst abdomen	1
Wound infection	3

TABLE II. Treatment and Outcome of Patients With Intrathoracic Anastomotic Leak

Type of leak	No. patients	Treatment		Patients salvaged
		Surgical	Conservative	
Major	2	2	0	2
Moderate	6	2	4	4
Minor	2	0	2	2
Total	10	4	6	8

orally, continuous nasogastric suction, aggressive accurate use of chest drains under fluoroscopic guidance, and nutritional support by a jejunostomy. Other supportive measures included antibiotics based on culture and sensitivity, intensive physiotherapy, and daily chest roentgenograms [25].

Two patients with major anastomotic disruptions required surgical re-exploration and oesophagogastric disconnection and successfully underwent a substernal coloplasty at a later date. Patients with asymptomatic, minor leaks only required delaying of oral feeds until radiologic examination showed healing of the anastomosis (Table II). Contrast studies were done in these two patients of radiological leaks, as there was difficulty in performing the anastomosis at the time of operation.

Conservative management was instituted in four patients with moderate leaks on clinical suspicion despite a negative contrast study done on the eighth postoperative day (Table III). In two of these four patients, a contrast study on postoperative days 12 and 33, respectively, confirmed an anastomotic disruption, and they recovered on conservative management.

TABLE III. Results of Contrast Study in Patients With Anastomotic Leak

Type of leak	Study at first suspicion of leak[a]	Study done subsequently[a]
Major	+	−
(n = 2)	+	−
	+	−
	+	−
Moderate	−	+
(n = 6)	−	+
	−	Surgery
	−	Surgery
Minor	+	−
(n = 2)	+	−

[a]Anastomotic leak present (+); no anastomotic leak (−).

In the remaining two patients, leaks were confirmed on surgical re-exploration, which was required for persistence of sepsis despite conservative measures. Both these patients eventually died of sepsis and multiple organ failure.

The hospitalization and morbidity data are shown in Table IV. Intensive care and tracheal reintubation for ventilatory support were required only in patients who underwent re-exploration. Oral feeding was considerably delayed in patients with major leaks due to a second stage coloplasty.

DISCUSSION

Richard Sweet, in 1945, published his initial experience in the surgical management of cancer of the oesophagus, reporting a significant morbidity and a 25% mortality rate [26]. A more recent comparison of the operative mortality and morbidity following transthoracic oesophagectomy with intrathoracic anastomosis is shown in Table V. Most authors report pulmonary complications as the major cause of postoperative morbidity and mortality [6–8,11,12].

However, in this series, excluding patients with anastomotic leak, pneumonitis, and respiratory failure requiring intensive care or ventilatory support did not occur in any of the patients. This is probably attributable to formal, preoperative instruction in chest physiotherapy, adequate relief of postoperative pain, and early commencement of postoperative physiotherapy. Other factors include correction of anaemia, fluid, and electrolyte imbalances and possibly early extubation.

Pulmonary complications (collapse, pneumonitis, infected pleural contents) may occur in patients with anastomotic leaks, unconfirmed on radiologic examination. This was observed in two patients with moderate leaks who developed early pulmonary complications (pneumonitis

TABLE IV. Hospitalization and Morbidity Data on Patients With Anastomotic Leak

Variable (median)	Type of leak, management			
	Major Surgical	Moderate Surgical	Moderate Conservative	Minor Conservative
	(n = 2)	(n = 2)	(n = 4)	(n = 2)
Ventilatory support (d)[a]	7	5	0	0
I.C.U.[b] stay (d)	14	6	0	0
Hospital stay (d)	52	20	43	25
Enteral feeds (d)	160	—	57	25
Day of oral feeds (d)[c]	150	—	48	20

[a](d), number of days.
[b]Intensive care unit.
[c]Day of oral feeds, postoperative day of commencing oral feeds following the first resectional surgery.

TABLE V. Results of Transthoracic Oesophagectomy for Carcinoma Oesophagus

Author	Resection technique[a]	No. patients	Operative mortality %	Operative morbidity %
Putnam et al., 1994 [6]	R Thor	134	8.2	51.5
Lozach et al., 1991 [7]	R Thor	100	4	22
Page et al., 1990 [8]	L Thor	115	9	16
Pradhan et al., 1989 [9]	L Thor	110	2.7	19
Ellis, 1989 [10]	L, R Thor	196	1.5	25
Mathisen et al., 1988 [11]	L, R Thor	104	2.9	15
King et al., 1987 [12]	R Thor	100	3	27
Goldfaden et al., 1986 [13]	R Thor	41	14	86
Present series, 1994	L, R Thor	111	1.8	35

[a]L Thor = left thoracotomy; R Thor = right thoracotomy.

and infected pleural contents), but contrast studies did not confirm anastomotic disruptions until postoperative days 12 and 33. Both these patients were salvaged by instituting conservative management on clinical suspicion of a leak, without waiting for radiologic confirmation. In this series, significant primary pulmonary complications in the absence of an anastomotic disruption were unusual. Any significant pulmonary complication occurring after the fourth postoperative day led us to suspect an anastomotic disruption, which may be radiologically manifest or latent.

Some early clinical signs that raised suspicion of a leak include: (1) temperature of 101 degrees Fahrenheit and above beyond the fourth postoperative day or a rise after the temperature has settled to normal, (2) bronchospasm in a previously clear chest (it may occur on commencing oral feeds) or tachypnoea, (3) appearance of new densities on chest roentgenogram, (4) abdominal signs such as persistent ileus or rebound tenderness, which occur secondary to tracking of infected mediastinal contents in the abdomen via the hiatus, although this is uncommon, and/or (5) patient was hesitant to increase oral intake or was not recovering as expected after 10 days of surgery [25].

Each of the above signs may occur in patients without a suture line disruption, but once detected a cautious approach was adopted, i.e., to withold oral feeds and continue respiratory care until the signs resolved. The key elements in salvaging patients with intrathoracic anastomotic disruption are: (1) keen postoperative vigilance with a high index of suspicion for a leak ensures *early diagnosis* [27], (2) accurate, aggessive *thoracic drainage* (pleural and mediastinal) to establish total lung expansion [25], (3) *nutritional support* (via a jejunostomy in this series), which accounts in large part for the improved results with these postoperative oesophageal complications [28]; early enteral nutrition reduces septic complications in critically injured patients [29], and (4) *surgical intervention* for major anastomotic disruption on postoperative days 8 and 9 helped salvage both patients. They required oesophagogastric disconnection with cervical oesophagostomy, gastrostomy, and a second stage substernal coloplasty.

Two patients with moderate leaks required surgical reexploration on postoperative days 9 and 16, respectively, for persistence of sepsis, evidenced by continued fever >101°F, persistence of abdominal signs, and worsening pneumonitis on chest roentgenogram. Both these patients eventually died of sepsis and multiple organ failure. Of these two leak-related deaths, one was a salvage surgery

(Ivor Lewis procedure) for recurrent disease following radical radiotherapy, and in the other case, the diagnosis was probably delayed as the leak manifested in the upper abdomen after a low leftsided intrathoracic anastomosis. The first case required an oesophagogastric disconnection and the latter, abdominal exploration with peritoneal lavage.

Perhaps the most critical factor in salvaging patients with anastomotic leak by surgical re-intervention is its timing. Tam et al. [4] report a 75% mortality in patients re-explored for an anastomotic leak, 7–22 days from the initial operation, and recommend early intervention when re-exploration becomes necessary.

CONCLUSION

The perioperative morbidity and mortality following an intrathoracic anastomosis after an oesophageal resection can be minimised by adequate preoperative preparation, meticulous operative technique, and vigilant postoperative care, thereby making it a safe procedure.

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